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The tangent streak bifocal contact lens: A clinical evaluation

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Abstract

As the general population grows older, the number of contact lens wearers becoming presbyopic is increasing. For many of these patients, bifocal contact lenses are a welcomed alternative to spectacle wear. The Tangent Streak Bifocal is a recent entry into the field of bifocal contact lenses, and is especially suited to patients who are former rigid lens wearers, and those who demand crisp optics at near and far distances. This clinical evaluation of ten subjects explored patient characteristics which allow the Tangent Streak Bifocal to best perform as it was designed, and also attempted to determine whether simple changes in lens parameters might affect lens performance in specific instances.

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THE TANGENT STREAK BIFOCAL CONTACT LENS: A CLINICAL EVALUATION

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Thank you and much love to our parents.

ABSTRACT

As the general population grows older, the number of contact lens wearers becoming presbyopic is increasing. For many of these patients, bifocal contact lenses are a welcomed alternative to spectacle wear.
The Tangent Streak Bifocal is a recent entry into the field of bifocal contact lenses, and is especially suited to patients who are former rigid lens wearers, and those who demand crisp optics at near and far distances.
This clinical evaluation of ten subjects explored patient characteristics which allow the Tangent Streak Bifocal to best perform as it was designed, and also attempted to determine whether simple changes in lens parameters might affect lens performance in specific instances.

KEY WORDS

Presbyopia; Bifocal contact lens

Executive; Tangent Streak Bifocal

Rigid Gas Permeable

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INTRODUCTION:

When contact lens patients become presbyopes, the optometrist must decide which type of correction will benefit the individual the most, depending on that patient's occupational and recreational needs, on his or her health and visual needs, and to a certain extent, on what the patient desires. The traditional solution to presbyopia is a pair of bifocal spectacles. Today, alternate solutions, in the form of bifocal contact lenses, are available.

A variety of different types of rigid gas-permeable bifocal contact lenses are available, each offering advantages for individual patients. Careful selection of lens design for each patient is of utmost importance to the success of a particular case.[1]

The Tangent Streak Bifocal contact lens is one method of treatment especially suited to presbyopes who are former RGP or PMMA contact lens wearers. The Tangent Streak is an executive-type segment, one-piece translating bifocal lens of rigid gas permeable material. It has prism ballast and is truncated for stability and proper positioning. It offers reasonable sized distance and near optic zones, and excellent visual acuity at both near and far distances. The distance and reading curves meet at the geometric center of the lens in a tangent, and there is no image jump.[2]

The Tangent Streak is custom designed and is available in base curves from 6.50 mm to 8.50 mm and distance powers +20.00 to -20.00 D. Add power available is +0.75 to +4.00 D. Horizontal lens size ranges from 8.00 mm to 10.50 mm, and prism powers are from 1.75 to 4.00 Δ.[2]

The lens is fit comparatively flat and loose, allowing for free translation which is required for proper positioning of the distance and near portions. The lens is designed to position low in primary gaze, with the segment line approximately 1.3 mm below the visual axis for

the average patient. On downgaze, as in reading, the truncated inferior edge of the lens encounters the patient's lower lid, causing the lens to translate, so that the line of sight now passes through the near optic zone.[2]

Our clinical evaluation of the Tangent Streak Bifocal had two objectives. The first was to qualitatively identify patient characteristics which were favorable for Tangent Streak wear, and which best allowed the lens to perform as it was designed. The second was to evaluate the manufacturer's recommended fitting procedures, and to determine whether altering suggested lens parameters might improve lens performance.

The authors had had no previous experience fitting soft or rigid bifocal contact lenses.

THE STUDY:

The study involved ten patients, seven females and three males, all presbyopes between the ages of 42 and 55 years. Patients were solicited by ads requesting subjects for the study. Selection criteria required that the subject be a presbyope from 40 to 55 years of age, in good health and having no contraindications to rigid lens wear. Motivation was a key factor in our selection, and individuals with a casual interest but who were unsure about investing the time required for the study were not selected to participate. Previous contact lens experience was desirable, although we did not exclude potential subjects who had no previous experience.

Seven subjects had previous experience with RGP or PMMA single vision contact lens wear, and two of these had worn other types of rigid bifocal contact lenses. Two patients were previous soft contact lens wearers, and the remaining patient had no previous experience with any contact lens wear.

Eight of the patients were myopic astigmats and two were hyperopic astigmats. Corneal curvatures ranged from 40.00 D to 47.37 D. Individuals were also graded according to:

1. palpebral fissure height (small= 9mm , medium=10-11mm , large=12+mm)
2. lid tonus (+3= good tonus, tight and elastic; +2= fair tonus, less elastic but lower lid not sagging; +1= poor tonus, some degree of lower lid sagging)
3. relationship of lower lid to lower limbus (lower lid at, above or below lower limbus)
4. motivation (fair, good, excellent)

An overview of our subject group and each individual's characteristics is found in Table 1.

Our diagnostic lens set consisted of 20 lenses having base curves from 40.00D to 47.00 , powers ±2.00 D with add power +2.00D, and prism power 2Δ.

The initial diagnostic lens fitting for each patient was performed with adherence to the procedures outlined in the manufacturer's fitting guide for the Tangent Streak Bifocal. After each subject's diagnostic examination and ordering, the lenses were dispensed and six to eight progress examinations were performed, at one to two week intervals. At each progress exam, distance and near Snellen visual acuity was measured, and lens fit, translation and centration were evaluated. In addition, the patient was asked to subjectively assess lens comfort and lens performance in daily activities. Lenses which did not perform adequately and could not be improved by the modifications suggested in the manufacturer's fitting guide were reordered with changes in parameters, usually lens size and/or prism power.

RESULTS:

Three patients in which the diagnostic lenses performed adequately during the initial fitting discontinued sometime after their lenses were dispensed. Reasons for discontinuing wear were related to patient characteristics rather than to poor or inadequate lens performance. One of the three relocated unexpectedly and dropped out of the study, one had excessive residual astigmatism which made her a questionable choice for spherical lenses, and one had no previous contact lens experience, and felt he "could not adapt" to rigid lenses.
One patient experienced very good lens performance with the lenses initially dispensed, and did not require refitting.

Six patients in which the initial lenses were not performing adequately were refit with a change in one or more lens parameters, including lens size, base curve, segment height and/or prism power. Rotation of 15 degrees or less, usually nasally, was in all cases remediated by blending the lenses, secondary curve more than peripheral curve, as the manufacturer recommends. Rotation greater than 15 degrees did not occur in our study. Three subjects experienced extreme decentration of their lenses, especially on lateral gaze. Because the Tangent Streak Bifocal is fit comparatively flat and loose, it tends to decenter on lateral gaze, especially when the wearer's palpebral fissure height is small. Two subjects who experienced decentration also tended to blink the lenses off the eyes in superior nasal gaze. Refitting with a larger lens with greater prism power remediated the decentration problem in each case. As the lens size increased, greater optic zone size reduced lateral blur problems. Summaries of lens parameters and performance for the first pair of lenses dispensed are found in Table 3 (First Lens) and for the second pair, when applicable, in Table 4 (Second Lens).

Although our sample size was small, we did notice some trends regarding patient characteristics which affected Tangent Streak performance:

1) Palpebral fissure height: Patients having medium to large (11mm or greater) vertical palpebral fissure heights had fewer decentration problems than patients having small fissures. Lenses tended to decenter nasally on eyes having small fissures.

2) Eyelid tonus: Good lid tonus enabled the lenses to translate adequately, and prevented the lower lens edge from slipping behind the lower lid. None of the subjects in our study had such poor lower lid tonus that translation was inhibited. One subject (CF) whose fissure height was small and whose upper lid tonus was poor experienced extremee nasal decentration of the lenses.

3) Lower lid relationship to lower limbus: Lower lids which were tangent to, or within 1mm above or below the lower limbus seemed to support the lenses in the proper position for primary and reading gazes. None of our subjects' lower lid to lower limbus relationships fell outside this range. We did reject one potential subject whose lower lids were 2mm below the limbus. In her case, the diagnostic lens simply did not approach the lower lid, and translation was very poor.

4) Motivaton: Although we attempted, by interview, to eliminate from consideration subjects who showed casual interest but little real motivation, we were not always successful. It became apparent that motivation level is difficult for the examiner to determine, and that this factor must be weighed in the context of the other factors in order to assess the patient's prognosis for success.

Patients' reasons for wanting bifocal contact lenses vary greatly. Individuals who hope to avoid the trouble of adapting to bifocal spectacles should be made to understand that adaptation difficulties are

transient, and eventually are minimized with perserverence on the part of the patient. All prospective bifocal contact lens patients should be advised that contact lenses require at least as much, usually more, adaptation than do spectacles.

5) Contact lens wearing experience: Patients who have worn RGP or PMMA contact lenses understand the adaptation process, and make the best candidates for the Tangent Streak Bifocal. Previous soft contact lens patients may have unrealistic expectations as to the comfort of rigid lenses, and are generally poorer candidates. Patients who have no previous contact lens experience, as well as previous soft lens wearers, might first be adapted to single vision RGP lenses before attempting to wear RGP bifocal contact lenses.

DISCUSSION:

Based on our clinical observation of the fitting procedures and performance of the Tangent Streak Bifocal contact lens we conclude the following:

1) The decision as to what type of bifocal contact lens, if any, is to be used for a particular patient should be made on a case-by-case basis. The doctor should strive to provide the best presbyopic correction for an individual based on his or her own experience, and optical, eye health and patient lifestyle considerations. The occupational needs of the patient are an important consideration. Some peripheral image distortion and image blurring may be encountered in the adaptation period. Patients who can tolerate these distortions, and who are not engaged in excessive amounts of nearwork, tend to be more successful wearers than those who have extremely critical visual requirements.

2) Patients should have the anatomical lid structure necessary to insure adequate positioning and translation of the lens.

It is important that the individual have good lid tonus to aid in proper positioning of the lens. The lens translation depends on lens interaction with the lids, especially the lower lid which provides a stop for the inferior lens edge. The lower lid must be able to support the lower edge of the lens so that the near and distance portions are positioned properly during far and near viewing. The lower lid must also be in normal apposition to the globe and should position at or slightly above the lower limbus. The upper lid is also important, as excessively sagging lids may interfere with lens translation, or may reduce the useable distance optic zone to such a degree as to make this design unworkable. The vertical fissure height should be of medium to large size to utilize as much of the distance optic zone as possible.

3) Individual patients must, in addition to being good prospective bifocal contact lens wearers, be good rigid lens candidates. This includes such factors as adequate tear break-up time, low to moderate corneal toricity (.5 to 1.5 D), low residual astigmatism on over-refraction, and the absence of ocular disease and/or other factors for which lens wear is contraindicated. The best candidates are those who are wearing rigid gas-permeable or PMMA lenses at the time of the Tangent Streak fitting.

4) Previous experience with rigid gas-permeable or PMMA contact lens wear is highly recommended. The Tangent Streak Bifocal is quite comfortable for rigid contact lens wearers, who are already used to wearing a rigid lens and thus can devote their effort to adapting to the bifocal design. The Tangent Streak is fit flat and loose compared to most rigid lenses, thus will move more than the patient's previous lenses. Patients who are made aware of this fact before they begin wearing the bifocals will be better prepared to cope with the transient

adaptation symptoms which may occur. Previous soft lens wearers are poorer risks for rigid bifocal fitting, as they must adapt to the increased lid sensation in addition to the bifocal design, and are likely to prefer the comfort of their soft lenses. Patients who have not previously worn contact lenses, but are otherwise good Tangent Streak prospects, may be satisfactory candidates, but they (as well as previous soft lens wearers) should first be adapted to single vision rigid lens wear before attempting Tangent Streak wear.

5) Diagnostic fitting is vital in determining how the lens will perform on the eye, and should be performed whenever possible. The Tangent Streak fitting guide outlines a method of ordering from calculations, but also stresses that by far the most success is obtained through diagnostic fitting. We did not attempt to order any lenses without first performing a diagnostic fitting.

6) In measuring the eye to determine the bifocal segment height, the manufacturer recommends measuring the height of the visual axis to lower lid, then subtracting 1.3mm. We found use of a penlight and millimeter rule to be an easy and repeatable method of making this measurement, resulting in comfortable segment heights for all of our subjects. Other methods, such as use of a measuring ocular on the biomicroscope, might be explored in the future, to determine the most accurate, yet practical method for the average practitioner.

7) Lenses which exhibit low amounts of rotation (15 degrees or less) should be blended as the manufacturer's fitting guide recommends.

8) The fitting guide procedures should be followed as closely as possible. There are individual cases for which the recommended parameters may need to be altered. Several examples which we encountered with our subjects are as follows:

a) Patients having high corneal toricity (1.0 D or more) or with steep corneal curvatures (> 46.00 D) may require increased prism ballast, .5 to 1.0 Δ greater than the manufacturer recommends.

b) Corneas having minimal corneal toricity (<.5D) may require a lens having greater horizontal diameter (.4 to .6 mm) than the fitting guide recommends. At the same time, the ballast should be increased .25 to .50 Δ.

c) Lenses which exhibit excessive rotation may require increased ballast (.5 to .75 Δ).

d) With patients whose lower lid positions are below the lower limbus (.5 to 1.0 mm) in primary gaze, the truncation should be increased by .2 to .4 mm and/or the ballast increased .5Δ.

SUMMARY

When choosing to fit the Tangent Streak Bifocal, the examiner should keep in mind that, in general, factors which make a patient a successful rigid lens wearer also make the patient a good candidate for rigid bifocal contact lenses. The Tangent Streak appears to be a method of presbyopic correction especially suited to presbyopes who are former or present RGP or PMMA contact lens wearers.

For patients whose anatomical and other considerations make a translating bifocal the contact lens of choice, the Tangent Streak offers good visual acuity at near and far, good size distance and near fields of view, comfort and the advantages of a gas permeable material.

The Tangent Streak Bifocal should be chosen for a patient when it is the lens-of-choice for that individual.

Patient	Age/Sex	Occupation	Refractive Error	Keratometry	Palp fissure height	Lid Tonus	LLid to LLimbus	Best DVA	Motivation	Experience
M.D.	52f	Desk Clerk	OD -2.75-2.00x180 Add +2.25 OS -2.50-0.75x180 Add +2.25	OD 42.00@170/42.50@080 OS 42.00@005/42.25@095	medium OU	+2 OU	LLid above limbus	20/20 OD, OS	Excellent	Previous RGP/PMMA wearer (monovision)
L.F.	49f	Secretary	OD -3.00-1.25x095 Add+2.00 OS -3.25-0.75x075 Add+2.00	OD 44.25@010/43.50@090 OS 43.25@170/43.50@080	medium OU	+1 OU	LLid at Limbus	20/20 OD, OS	Good	Previous soft contact lens wearer
J.S.	43f	Homemaker	OD+4.00-1.00x135 Add+2.00 OD+3.50-0.50x055 Add+2.00	OD 40.50@005/41.50@095 OS 40.00@180/41.75@090	medium OU	+1 OU	LLid at Limbus	20/30 OD, OS	Fair	Previous RGP wearer
J.J.	43m	Social Service	OD +1.00-0.75x178 Add+1.75 OS +0.50-0.50x180 Add+1.75	OD 43.00@170/44.00@080 OS 44.00@005/45.50@095	small OU	+3 OU	LLid above limbus	20/20 OD, OS	Fair	No previous contact lens wear
M.M.	45f	Store Clerk	OD -3.75-0.50x090 Add+2.00 OS -4.00-1.00x180 Add+2.00	OD 43.25@170/44.37@080 OS 43.25@175/44.25@085	small OU	+3 OU	LLid above limbus	20/20 OD, OS	Good	Previous soft contact lens wearer
M.H.	42f	Teacher	OD -3.50-1.00x040 Add+1.00 OS -3.25-0.75x135 Add+1.00	OD 42.75@180/44.25@090 OS 42.75@180/44.25@090	medium OU	+3 OU	LLid above limbus	20/20 OD,OS	Excellent	Previous PMMA wearer (single vision)
P.S.	45f	Teacher	OD -4.75-0.75x025 Add+1.50 OS -5.75 DS Add+1.50	OD 44.50@020/46.75@110 OS 44.50@170/47.37@080	large OU	+3 OU	LLid below limbus	20/25 OD, OS	Excellent	Previous RGP wearer (single vision)
G.H.	44m	Admin. Manager	OD -0.50-1.00x047 Add+1.75 OS Pl-1.25x170 Add+1.75	OD 41.62@125/40.00@035 OS 41.00@170/42.00@080	large OU	+3 OU	LLid at limbus	20/20 OD, OS	Excellent	Previous RGP wearer (recent spectacle wear)
L.P.	53m	Teacher	OD -2.00 DS Add+1.75 OS -2.75-0.50x120 Add+1.75	OD 41.25@175/42.00@085 OS 42.50@175/42.25@080	medium OU	+3 OU	LLid above limbus	20/15 OD, OS	Excellent	Previous RGP wearer (simultaneous bifocal)
C.F.		Real Est.Agent	OD -4.25-1.25x090 Add+1.50 OS -4.25-2.00x090 Add+1.50	OD 42.25@165/42.12@075 OS 42.12@160/42.00@070	small OU	+2 OU	LLid above limbus	20/25 OD, OS	Excellent	Previous RGP wearer (single vision)

TABLE 1

TANGENT STREAK BIFOCAL: FIRST LENS

Patient	Tangent Streak Power/Add	Lens Size	Base Curve	Segm Height	Optic Zone	Prism Pwr	Dist. V.A.	Near V.A.	Comments
M.D.	OD -2.75 D (+2.25) OS -2.25 D (+2.25)	9.4/9.0 9.4/9.0	7.94 7.94	4.20 4.20	7.80 7.80	2.75 2.75	20/20 20/25	20/20 20/20	Comfort fair OU; Lens centers high OU Translation Poor OU; Refit OU
L.F.	OD -2.00 D (+2.00) OS -3.00 D (+2.00)	9.4/9.0 9.4/9.0	7.76 7.76	4.80 4.80	7.80 7.80	2.25 2.25	20/30 20/25	20/30 20/30	Comfort good OU; Rotation 15 deg nas OD, O deg OS Translation adequate OU Excessive resid. astig.; Discontinued.
J.S.	OD +4.75 D (+2.00) OS +4.00 D (+2.00)	9.4/9.0 9.4/9.0	8.33 8.23	4.70 4.70	7.80 7.80	2.00 2.00	20/30 20/30	20/20 20/20	Comfort good OU Patient relocated unexpectedly; Discontinued
J.J.	OD +2.00 D (+1.50) OS +2.00 D (+1.50)	8.9/8.5 8.9/8.5	7.85 7.67	3.70 3.70	7.30 7.30	2.00 2.00	20/20 20/20	20/20 20/20	Comfort poor OU Rotation 8 deg nas OU solved by blend Translation adequate OU Discontinued; unable to adapt to wear
M.M.	OD -1.50 D (+1.50) OS -1.50 D (+1.50)	8.4/8.0 8.4/8.0	7.94 8.04	3.00 3.00	7.00 7.00	2.00 2.00	20/20 20/20	20/20 20/20	Comfort good OU Rotation 10 deg nas OD solved by blend Translation adequate w/some blurring Extreme nasal decentration OU; Refit
M.H.	OD -2.75 D (+1.00) OS -2.75 D (+1.00)	9.8/9.2 9.8/9.2	7.85 7.85	4.70 4.70	8.20 8.20	2.25 2.25	20/20 20/20	20/20 20/30	Comfort fair OU; inf edge sensation OU Rotation 5 deg nas OU solved by blend Translation adequate OU Corneas steepened; Refit OU
P.S.	OD -4.25 D (+1.50) OS -5.25 D (+1.50)	9.6/9.2 9.6/9.2	7.5 7.5	4.80 4.80	8.20 8.20	2.50 2.75	20/25 20/25	20/20 20/20	Comfort good OU Rotation 0 deg OU Translation poor OU Refit OU
G.H.	OD +5.00 D (+1.75) OS +5.00 D (+1.75)	9.8/9.2 9.8/9.2	8.28 8.13	4.70 4.70	8.20 8.20	2.50 2.50	20/20 20/20	20/20 20/20	Comfort very good OU Rotation 5 deg nas solved by blend Translation adequate OU No refit
L.P.	OD -0.50 D (+1.75) OS -1.50 D (+1.75)	9.4/9.0 9.4/9.0	8.39 8.23	4.20 4.20	7.80 7.80	2.50 2.50	20/20 20/20	20/20 20/20	Comfort very good OU Rotation 15 deg nas OU solved by blend Translation adequate OU Blur in lateral gaze; Refit OU
C.F.	OD -3.50 D (+1.50) OS -3.50 D (+1.50)	8.6/8.1 8.6/8.1	8.61 8.61	3.50 3.50	7.40 7.40	2.50 2.50	20/30 20/30	20/30 20/30	Comfort very good OU Rotation 0 deg OU Translation adequate OU Extreme nasal decentration; Refit OU

TABLE 2

TANGENT STREAK BIFOCAL: SECOND LENS

Patient	Tangent Streak Power/Add	Lens Size	Base Curve	Segm Height	Optic Zone	Prism Pwr	Dist. V.A.	Near V.A.	Comments
M.D.	OD -2.75 D (+2.25) OS -2.25 D (+2.25)	9.9/9.5 9.9/9.5	7.94 7.94	5.00 5.00	8.30 8.30	2.75 2.75	20/20 20/25	20/20 20/20	Comfort fair OU due to seasonal allergy Rotation 0 deg OU Translation adequate OU
L.F.									Discontinued due to excessive residual astigmatism.
J.S.									Discontinued; patient relocated unexpectedly
J.J.									Discontinued; patient felt he could not adapt to contact lens wear.
M.M.	OD -1.50 D (+1.50) OS -1.50 D (+1.50)	9.4/9.0 9.4/9.0	7.94 8.04	3.40 3.40	7.80 7.80	3.00 3.00	20/20 20/20	20/20 20/20	Comfort good OU but < first lenses Rotation 0 deg OU Translation adequate Reappearence of SCL induced GPC's
M.H.	OD -2.75 D (+1.00) OS -2.75 D (+1.00)	9.8/9.0 9.8/9.0	7.85 7.85	4.70 4.70	8.20 8.20	2.25 2.25	20/20 20/20	20/20 20/30	Comfort good OU Rotation 0 deg OU Translation adequate OU
P.S.	OD -4.25 D (+1.50) OS -5.25 D (+1.50)	9.9/9.7 9.9/9.7	7.5 7.5	4.80 4.80	8.00 8.00	3.00 3.00	20/25 20/25	20/20 20/20	Comfort good OU Rotation 0 deg OU
G.H.									First lenses gave good comfort and good performance in all respects. No refit required.
L.P.	OD -0.50 D (+1.75) OS -1.50 D (+1.75)	10.4/9.0 10.4/9.0	8.23 8.25	4.20 4.20	8.80 8.80	2.50 2.50	20/20 20/20	20/20 20/20	Comfort very good OU Rotation 0 deg OU Translation adequate OU No lateral gaze blur OU
C.F.	OD -3.50 D (+1.50) OS -3.50 D (+1.50)	8.8/7.8 8.8/7.8	8.13 8.13	4.20 4.20	7.40 7.40	3.00 3.00	20/20 20/25	20/20 20/20	Comfort good OU Rotation 0 deg OU Translation adequate OU Slight nasal decentration OU

TABLE 3

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